

MAY 13 1981

PSD Permit Application - Arco Alaska, Inc.  
Kuparuk Oil Field, Alaska

Raymond Nye  
New Source Permits Section (M/S 521)

Robert B. Courson, Chief  
Technical Support Branch (M/S 329)

On May 11, 1981, we received an application from Arco Alaska, Inc. for a PSD permit to construct additional facilities at the Kuparuk, Alaska Oil Field.

Please review the application for completeness. In addition, determine for which pollutants BACT is necessary and for those pollutants requiring BACT, determine if the proposal employs the necessary technology. Also, please evaluate the air quality impact analysis and determine if there will be any violations of increments or standards. Identify any problems of a policy nature as early as possible so their resolution will not unnecessarily delay the review process.

In order to expedite this request, please feel free to contact the Company directly for any information you need. You may also want to schedule a meeting between key Company personnel and EPA staff. Any correspondence between EPA and the Company should be routed through me for the purpose of keeping our records straight.

We are required to respond to PSD applications within 30 days of receipt with a determination as to the completeness of that application. In this regard, please reply at your earliest convenience, but not later than May 29, 1981.

Attachment

cc: Paul Boys, w/o attach  
Mike Trutna, w/attach  
Rich Biondi, w/o attach  
Stan Hungerford, ADEC w/attach

RNYE:jb:5-12-81(#0905N)

USEPA REG



0000026



ARCO Alaska, Inc.

North Slope Exploration & Producing Operations

Post Office Box 360

Anchorage, Alaska 99510

Telephone 907 277 5637

Paul B. Norgaard

Vice President



May 6, 1981

United States Environmental  
Protection Agency  
Region X  
MS/521  
1200 Sixth Avenue  
Seattle, Washington 98101

Gentlemen:

Enclosed is an application for a "PSD Permit For New Sources To Be Added To the Kuparuk, Alaska Oil Field," prepared for ARCO by Radian Corporation.

This application reflects an anticipated development plan, covering as many as four oil and gas processing facilities and 100 drill sites within the development area. We are making application for the permit addressing these proposed facilities because of our requirement to commence construction of some of the sources during the winter of 1981-1982. We are hopeful that a PSD permit will be in place by January 1, 1982, and thus avoid a request for a construction waiver.

Due to the nature of this oil and gas project, the preliminary plan contained in this application can be expected to change as the plan evolves and becomes more firm. In spite of this, the information contained here is a proper effort for assessment of the project impacts for permitting our 1981-1982 sealift facilities.

Finalized plans beyond 1982 that may reflect necessary modifications to this application, will be forwarded to your office as necessary. It is not anticipated that future refinements of the plan submitted in this application will drastically affect the overall predicted emissions or affects contained in this application.


RECEIVED  
MAY 11 1981  
PERMITS BRANCH  
EPA - REGION 10



United States Environmental  
Protection Agency  
Page Two  
May 6, 1981

We appreciate your diligent attention to the matter of our  
PSD permit application. Thank you.

Very truly yours,



P. B. Norgaard  
Vice President

tmw

Enclosure

cc: Mr. Stan Hungerford, Alaska Department of Environmental  
Conservation, Juneau



Mail Stop 524

29 DEC 1981

Mr. Stan Hungerford  
Air Pollution Control Agency  
State of Alaska  
Pouch O  
Juneau, Alaska 99811

Dear Mr. Hungerford:

EPA, Region 10, has made a final determination on the ARCO Alaska Inc.'s (ARCO) proposal to install additional gas-fired turbines and heaters at the Kuparuk oil field complex at Kuparuk, Alaska.

Enclosed are copies of the PSD permit, final determination document and letter of approval to ARCO to be added to the existing public review package and made available to the public for an additional sixty (60) days. The package can be destroyed at the end of the review period.

Thank you for your cooperation in this matter.

Sincerely,

*/s/ mms*

Michael M. Johnston, Chief  
Permits Section

Enclosures

RNye:ee 11/19/81 (2023C)



U. S. ENVIRONMENTAL PROTECTION AGENCY  
REGION 10  
SEATTLE, WASHINGTON 98101

NOTICE OF ISSUANCE OF PSD PERMITS TO  
ARCO ALASKA, INC. and GORGE ENERGY COMPANY

Notice is hereby given that on December 29, 1981, the Environmental Protection Agency (EPA) issued a Prevention of Significant Deterioration (PSD) permit to Gorge Energy Company for approval to construct a 15-megawatt coal and wood-fired boiler and turbine facility at Bingen, Washington, and a PSD permit to ARCO Alaska, Inc. to install additional gas-fired turbines and heaters in the oil field at Kuparuk, Alaska.

These permits have been issued under EPA's Prevention of Significant Air Quality Deterioration (40 CFR Part 52.21) regulations, subject to certain conditions specified in the permits.

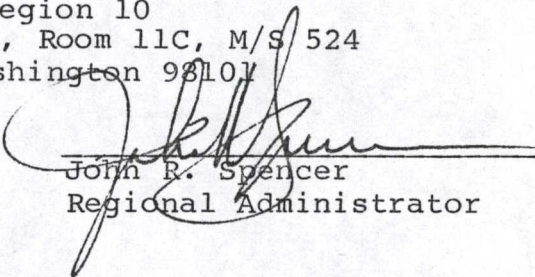
Under Section 307(b) of the Clean Air Act, judicial review of a PSD Permit is available only by the filing of a petition for review in the Ninth Circuit Court of Appeals within 60 days of today. Under Section 307(b)(2) of the Clean Air Act, the requirements which are the subject of today's notice may not be challenged later in civil or criminal proceedings brought by EPA to enforce these requirements.

Copies of the permits are available for public inspection upon request at the following location:

EPA, Region 10  
1200 Sixth Avenue, Room 11C, M/S 524  
Seattle, Washington 98101

29 DEC 1981

\_\_\_\_\_  
Date

  
\_\_\_\_\_  
John R. Spencer  
Regional Administrator



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8 U.S. ENVIRONMENTAL PROTECTION AGENCY  
9 REGION 10  
10 SEATTLE, WASHINGTON 98101

11 APPLICATION OF )  
12 ARCO Alaska, Inc. ) No. PSD-X82-01  
13 P.O. Box 360 ) APPROVAL OF  
Anchorage, Alaska 99510 ) APPLICATION  
TO CONSTRUCT

14  
15 Pursuant to the Agency regulations for the Pre-  
16 vention of Significant Deterioration of Air Quality (PSD)  
17 set forth at Title 40, Code of the Federal Regulations,  
18 Part 52 and based upon the complete application submitted  
19 on May 11, 1981 by ARCO Alaska, Inc., the Regional  
20 Administrator now finds as follows:

21 FINDINGS

22 1. ARCO Alaska, Inc. (hereafter referred to as ARCO)  
23 proposes to install additional gas-fired turbines and  
24 heaters in the oil field at Kuparuk, Alaska.

25 2. An analysis of projected emissions indicates that  
26 this project has the potential to emit more than the EPA  
27 significant levels for nitrogen oxides (NO<sub>x</sub>), parti-  
28 culate matter (PM), carbon monoxide (CO), sulfur dioxide  
29 (SO<sub>2</sub>), and hydrocarbons (VOC) and is therefore subject  
30 to PSD review for those pollutants.



3. The proposed modification is located in an area designated as "Class II" under Section 162(b) of the Clean Air Act.

4. Modeling analysis of NO<sub>x</sub>, PM, CO, SO<sub>2</sub> and VOC has been conducted and demonstrates that while emissions of these pollutants will increase, the modification will not cause any violations of the applicable National Ambient Air Quality Standards or PSD increments so long as the facilities are operated in accordance with the conditions specified below. With the application of best available control technology, as required by Section 165(a)(4), operation of the proposed turbines and heaters will meet the applicable PSD requirements.

Accordingly, it is hereby determined that, subject to the conditions set forth below, ARCO Alaska, Inc. will be permitted to install the subject turbines and heaters at Kuparuk, Alaska.

#### APPROVAL CONDITIONS

1. Emissions of nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO), particulate matter (PM), sulfur dioxide (SO<sub>2</sub>) and hydrocarbons (VOC) shall not exceed the following:

#### EMISSION LIMITATIONS

<u>Equipment</u>	<u>Pollutant</u>	<u>Tons/Year</u>	<u>Performance Limit</u>
Turbines	NO <sub>x</sub>	13,730	150 (14.4/Y)ppm*
	CO	2,730	109 lb/10 <sup>6</sup> scf
	PM	293	of fuel used
	SO <sub>2</sub>	72	10% opacity
	VOC	50	
Process Heaters	CO	42	0.018 lb/10 <sup>6</sup> BTU
	PM	39	
	SO <sub>2</sub>	9	



<u>Equipment</u>	<u>Pollutant</u>	<u>Tons/Year</u>	<u>Performance Limit</u>
> 43x10 <sup>6</sup> BTU/hr	NO <sub>x</sub>	384	0.18 lb/10 <sup>6</sup> BTU
< 43x10 <sup>6</sup> BTU/hr	NO <sub>x</sub>		0.10 lb/10 <sup>6</sup> BTU

Waste incinerator - see Appendix A

\*NO<sub>x</sub> emission factor for gas-fired turbines is modified by an efficiency factor Y (manufacturer's rated heat rate at rated peak load) which cannot exceed 14.4

kilojoules/watt-hour based at 15% oxygen on a dry basis.

2. With the exception of NO<sub>x</sub>, CO, PM, SO<sub>2</sub> and VOC increases in potential emissions of any pollutant regulated under the Clean Air Act resulting from this operation will be less than the significant levels (Section 52.21(b)(23)(i)).

3. ARCO shall notify Alaska Department of Environmental Conservation (ADEC) of any occurrence of any emissions in excess of limits specified in Condition Numbers 1 and 2 above; such notification shall be forwarded to ADEC in writing in a timely fashion and in each instance no later than ten (10) days from the date of such occurrence. The notification shall include an estimate of the resultant emissions and a narrative report of the cause, duration and steps taken to correct the problem and avoid a recurrence. ARCO shall contemporaneously send a copy of all such reports to EPA.

4. This approval shall become void if on-site construction is not commenced within eighteen (18) months after receipt of the approval or if on-site construction once initially commenced is discontinued for a period of eighteen (18) months.

5. As approved and conditioned by this permit any construction, modification, or operation of the proposed



1 facility shall be in accordance with the application which  
2 resulted in this permit. Nothing in this permit shall be  
3 construed to relieve ARCO Alaska, Inc. of its obligations  
4 under any State or Federal laws including Section 303 and  
5 114 of the Clean Air Act.

6 6. Compliance with emission limitations shall be  
7 demonstrated by source tests and a program of emission  
8 monitoring as described below:

9 a. Compliance Demonstration:

10 Compliance testing shall be conducted within  
11 60 days after achieving the maximum production rate at  
12 which the turbines or process heaters will be operated but  
13 not later than 180 days after startup of the specific  
14 emission source. The NSPS testing requirements for NO<sub>x</sub>  
15 from gas turbines (40 CFR 60.335) shall be followed. The  
16 Company may submit for EPA approval an alternative test  
17 plan for the gas turbines addressing such alternatives as  
18 factory testing rather than on-site testing and testing of  
19 a certain proportion of the gas turbines from each model  
20 group rather than each individual gas turbine. EPA Method  
21 7 shall be used for NO<sub>x</sub> from the process heaters. Only  
22 one of each kind of process heater must be tested. The  
23 Company shall submit a test plan to EPA for approval to  
24 demonstrate that the process heater tested is repre-  
25 sentative of the process heaters for which testing is  
26 exempted. No compliance testing is required for CO.

27 b. Emission Monitoring:

28 In addition to the NSPS requirements (40 CFR  
29 60.334) one of the following monitoring schemes is  
30 required: (a) a continuous monitoring system shall be  
31



1 installed to monitor CO or O<sub>2</sub> for all gas-fired process  
2 heaters. These monitors shall comply with the specifi-  
3 cation requirements in Appendix B of 40 CFR Part 60; or  
4 (b) a periodic monitoring program for the process heaters  
5 using a portable CO or O<sub>2</sub> analyzer. The Company shall  
6 submit a monitoring plan to EPA for approval describing  
7 the details of the program such as monitoring frequency,  
8 proposed instrumentation, quality assurance procedures,  
9 and recordkeeping.

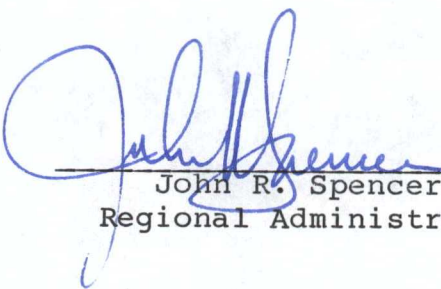
10 c. The Company shall report any use of the COT  
11 flare, including the time, duration, and reason for that  
12 use. This data shall be available to EPA upon request and  
13 maintained for a period of 2 years from the date recorded.

14 7. EPA Regional Office and ADEC shall be notified of  
15 the commencement of construction and the start-up date  
16 within thirty (30) days of the date of their occurrence.

17 Access to the source by EPA or State regulatory  
18 personnel will be permitted upon request for the purpose  
19 of compliance assurance inspections. Failure to allow  
20 such access is grounds for revocation of this permit.

21  
22  
23 29 DEC 1981

24 \_\_\_\_\_  
Date

25   
26 \_\_\_\_\_  
John R. Spencer  
Regional Administrator



Appendix A

Emission Limitations

<u>Equipment</u>	<u>Pollutant</u>	<u>Ton/Year</u>	<u>Performance Limit</u>
Waste incinerator	NO <sub>x</sub>	8	0.01 gr/dscf at 12% CO <sub>2</sub> , and 10% opacity
	CO	17	
	PM	5	
	SO <sub>2</sub>	4	
	VOC	0.5	



PS Form 3811, Jan. 1979

● **SENDER:** Complete items 1, 2, and 3.  
Add your address in the "RETURN TO" space on reverse.

1. The following service is requested (check one.)

- ☐ Show to whom and date delivered..... ¢  
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☐ RESTRICTED DELIVERY  
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(CONSULT POSTMASTER FOR FEES)

2. **ARTICLE ADDRESSED TO:**

P.B. Norgaard  
ARCO - Kuparuk

3. **ARTICLE DESCRIPTION:**

REGISTERED NO. | CERTIFIED NO. | INSURED NO.

3403968

(Always obtain signature of addressee or agent)

I have received the article described above.

SIGNATURE

☐ Addressee

☒ Authorized agent

4. **DATE OF DELIVERY**

POSTMARK

5. **ADDRESS (Complete only if requested)**

6. **UNABLE TO DELIVER BECAUSE:**

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INITIALS

RETURN RECEIPT, REGISTERED, INSURED AND CERTIFIED MAIL



849-88-0101 : 0101

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- Complete items 1, 2, and 3 on the reverse.
- Attach to front of article if space permits, otherwise affix to back of article.
- Endorse article "Return Receipt Requested" adjacent to number.

PENALTY FOR PRIVATE  
USE TO AVOID PAYMENT  
OF POSTAGE, \$300



**RETURN  
TO**



**ENVIRONMENTAL PROTECTION AGENCY**

REGION X - 1200 SIXTH AVE.

SEATTLE, WASHINGTON 98101

m/s 521

\_\_\_\_\_  
(Name of Sender)

\_\_\_\_\_  
(Street or P.O. Box)

\_\_\_\_\_  
(City, State, and ZIP Code)



P15 3403968

# RECEIPT FOR CERTIFIED MAIL

NO INSURANCE COVERAGE PROVIDED—  
NOT FOR INTERNATIONAL MAIL

(See Reverse)

SENT TO				
R. B. Norgaard				
STREET AND NO.				
ARCO Kuparuk				
P.O., STATE AND ZIP CODE				
POSTAGE			\$	
CONSULT POSTMASTER FOR FEES	OPTIONAL SERVICES	CERTIFIED FEE		¢
		SPECIAL DELIVERY		¢
	RETURN RECEIPT SERVICE	RESTRICTED DELIVERY		¢
		SHOW TO WHOM AND DATE DELIVERED		¢
		SHOW TO WHOM, DATE, AND ADDRESS OF DELIVERY		¢
		SHOW TO WHOM AND DATE DELIVERED WITH RESTRICTED DELIVERY		¢
	SHOW TO WHOM, DATE AND ADDRESS OF DELIVERY WITH RESTRICTED DELIVERY		¢	
TOTAL POSTAGE AND FEES			\$	
POSTMARK OR DATE				



**STICK POSTAGE STAMPS TO ARTICLE TO COVER FIRST CLASS POSTAGE,  
CERTIFIED MAIL FEE, AND CHARGES FOR ANY SELECTED OPTIONAL SERVICES. (see front)**

1. If you want this receipt postmarked, stick the gummed stub on the left portion of the address side of the article, **leaving the receipt attached**, and present the article at a post office service window or hand it to your rural carrier. (no extra charge)
2. If you do not want this receipt postmarked, stick the gummed stub on the left portion of the address side of the article, date, detach and retain the receipt, and mail the article.
3. If you want a return receipt, write the certified-mail number and your name and address on a return receipt card, Form 3811, and attach it to the front of the article by means of the gummed ends if space permits. Otherwise, affix to back of article. Endorse front of article **RETURN RECEIPT REQUESTED** adjacent to the number.
4. If you want delivery restricted to the addressee, or to an authorized agent of the addressee, endorse **RESTRICTED DELIVERY** on the front of the article.
5. Enter fees for the services requested in the appropriate spaces on the front of this receipt. If return receipt is requested, check the applicable blocks in Item 1 of Form 3811.
6. Save this receipt and present it if you make inquiry.



## UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Mail Stop 524  
CERTIFIED MAIL - RETURN RECEIPT REQUESTED

DEC 24 1981

Mr. P.B. Norgaard  
ARCO Alaska, Inc.  
P. O. Box 360  
Anchorage, Alaska 99510

Dear Mr. Norgaard:

We have evaluated your application for a Prevention of Significant Deterioration (PSD) permit to install additional gas-fired turbines and heaters at the Kuparuk oil field and have determined that the project will meet the requirements of the PSD permit regulations and the Clean Air Act. Accordingly, on the basis of the complete PSD permit application, EPA hereby grants its approval to ARCO Alaska, Inc. to modify the existing Kuparuk facilities subject to the terms and conditions contained in the enclosed permit. Also enclosed is EPA's Final Determination Analysis Document for this project.

As established in the Consolidated Permit Regulations, codified at 40 CFR Part 124, this permit is effective immediately.

Sincerely,

/s/sJohn R. Spencer

John R. Spencer  
Regional Administrator

Enclosures

cc: Scott Ronsio, ARCO

				CONCURRENCES			
SYMBOL	RNYe.e	11/19/81	(2025C)				
SURNAME	JOHNSTON	ROSS	SMITH	GG			
DATE	12/21/81	12/22/81	12/22/81				



FINAL DETERMINATION ANALYSIS DOCUMENT  
PREVENTION OF SIGNIFICANT DETERIORATION

APPROVAL OF CONSTRUCTION OF  
ARCO ALASKA, INC.'S  
TURBINES AND HEATERS  
AT KUPARUK, ALASKA

SCOPE

This document presents the final determination by the Environmental Protection Agency (EPA) to approve the construction of ARCO Alaska, Inc.'s turbines and process heaters at Kuparuk, Alaska under the Federal requirements of Part C, Prevention of Significant Deterioration of Air Quality (PSD).

BACKGROUND

On May 11, 1981, EPA Region 10 received from ARCO Alaska, Inc. a complete PSD permit application requesting approval to install turbines and process heaters. EPA reviewed this material and presented its findings in a preliminary determination document which was released for public comment and published in the Fairbanks "News Miner" and the Anchorage "Times" on November 12, 1981. A preliminary determination to approve the facility was issued on the basis that the National Ambient Air Quality Standards (NAAQS) and PSD increments would not be exceeded and that Best Available Control Technology (BACT) would be employed. Affected governmental agencies and the general public were notified of their opportunity to submit written comments and request a public hearing regarding EPA's preliminary determination.

PUBLIC COMMENT

No comments and no requests for public hearings were received. It should be noted that a typographical error appeared on page two of the preliminary determination document with respect to the NO<sub>x</sub> emission limitation for gas-fired turbines. To be consistent with the technical analysis document in the public information package the correct NO<sub>x</sub> emission limitation in the preliminary determination document should read 150 ppm rather than 100 ppm.



FINDINGS

Based upon our review of the application, EPA finds that the "Class II" air quality increments and the NAAQS will not be exceeded as a result of this project and that the proposed construction will employ BACT. In light of these findings, EPA grants approval to install the turbines and heaters requested by ARCO Alaska, Inc. This approval is subject to the terms and conditions set forth in the letter of approval to ARCO Alaska, Inc.



FINAL DETERMINATION ANALYSIS DOCUMENT  
PREVENTION OF SIGNIFICANT DETERIORATION

APPROVAL OF CONSTRUCTION OF  
ARCO ALASKA, INC.'S  
TURBINES AND HEATERS  
AT KUPARUK, ALASKA

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Based upon our review of the application, EPA finds that the "Class II" air quality increments and the NAAQS will not be exceeded as a result of this project and that the proposed construction will employ BACT. In light of these findings, EPA grants approval to install the turbines and heaters requested by ARCO Alaska, Inc. This approval is subject to the terms and conditions set forth in the letter of approval to ARCO Alaska, Inc.

RNye:e 12/09/81 (2049C)

*REN 12/18/81*

## CONCURRENCES

SYMBOL								
SURNAME	Johnston	Pose	Smith	Spencer				
DATE	12/18/81	12/22/81	12/22/81					



U. S. ENVIRONMENTAL PROTECTION AGENCY  
REGION 10  
SEATTLE, WASHINGTON 98101

NOTICE OF APPLICATION TO CONSTRUCT AND PRELIMINARY DETERMINATION  
ARCO Alaska, Inc.

Notice is hereby given that the ARCO Alaska, Inc. (ARCO) has filed with the Environmental Protection Agency (EPA) an application to install gas-fired turbines and heaters at the Kuparuk Oil Field pursuant to EPA's regulation for prevention of significant air quality deterioration (the Clean Air Act as amended August 7, 1977). EPA regulations require the pre-construction review approval of certain categories of new or modified industrial sources of air pollution to assure that a proposed source's emissions will not cause a violation of air quality deterioration limits.

Notice is also given pursuant to Section 52.21(m)(2) of the PSD regulations that the PSD application contains an air quality impact analysis done using a model not found in "Guidelines on Air Quality Models" (EPA 450-2-78-027). The model (ISC), was used to predict nitrogen oxides, sulfur dioxide and total suspended particulate impacts due to facility construction. EPA consents to use of the ISC model because the "Guidelines" contain no models appropriate for use in the Prudhoe Bay situation.

The proposed turbines and heaters are needed to continue the development of the Kuparuk Oil Field.

PRELIMINARY DETERMINATION

EPA has completed a preliminary analysis of the information submitted by ARCO and has tentatively determined that the modification to the Oil Field will not cause significant deterioration of air quality and will employ best available control technology (BACT) to minimize emissions. EPA therefore, proposes to issue a Notice of Approval to modify the Kuparuk Oil Field Facilities.

PUBLIC COMMENT

An analysis document supporting this preliminary determination has been prepared by EPA and is available for review at:

EPA, Region 10  
Regional Library, 12th Floor  
1200 Sixth Avenue  
Seattle, Washington 98101



This document, together with the information submitted by the applicant, will also be available for public inspection at the following locations:

EPA, Alaska Operations Office  
701 'C' Street  
Federal Building, Room E535  
Anchorage, Alaska 98501

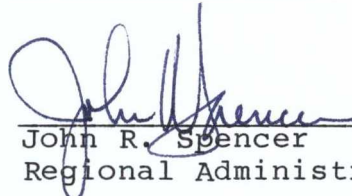
State of Alaska  
Department of Environmental Conservation  
Office of Air Programs  
Juneau, Alaska 99811

Fairbanks North Star Borough Regional Library  
1215 Cowles  
Fairbanks, Alaska

Z-J Loussac Library  
427 F  
Anchorage, Alaska

Interested persons are invited to submit for EPA's consideration written comments concerning the proposed project approval. A public hearing can be conducted to discuss the project if requested in writing during the first fourteen (14) days of the public comment period. Comments and requests for public hearing should be sent to the Regional Administrator, EPA, Region 10, 1200 Sixth Avenue, Seattle, Washington 98101; Attention: Mr. Michael Johnston. Written comments will be accepted for a period of 30 calendar days from the date of publication of this notice and will be made available for inspection at the above listed locations. To be most effective, comments should address air quality considerations and include support materials where available.

A copy of EPA's final determination regarding the proposed source (to be completed after close of the comment period) will be filed for inspection at the above listed locations. Only persons who filed comments on the draft permit or participated in the public hearing may petition the EPA Administrator to review any condition of the final permit decision.

  
John R. Spencer  
Regional Administrator

12 NOV 1981

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To be Published



U. S. ENVIRONMENTAL PROTECTION AGENCY  
REGION 10  
SEATTLE, WASHINGTON 98101

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ARCO Alaska, Inc.

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EPA, Region 10  
Regional Library, 12th Floor  
1200 Sixth Avenue  
Seattle, Washington 98101



This document, together with the information submitted by the applicant, will also be available for public inspection at the following locations:

EPA, Alaska Operations Office  
701 'C' Street  
Federal Building, Room E535  
Anchorage, Alaska 98501

State of Alaska  
Department of Environmental Conservation  
Office of Air Programs  
Juneau, Alaska 99811

Fairbanks North Star Borough Regional Library  
1215 Cowles  
Fairbanks, Alaska

Z-J Loussac Library  
427 F  
Anchorage, Alaska

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/s/John R. Spencer

John R. Spencer  
Regional Administrator

12 NOV 1981

CONCURRENCES							
SYMBOL	RCN						
SURNAME	NYE	JOHNSTON	ROSS	SMITH	COATE		
DATE	10-15-81	10/24/81	10/27/81				



M/S 521

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

OCT 30 1981

Mr. P. B. Norgaard  
ARCO Alaska, Inc.  
P.O. Box 360  
Anchorage, Alaska 99510

Dear Mr. Norgaard:

As you know, the federal requirements for the Prevention of Significant Air Quality Deterioration (PSD) state that EPA must make a preliminary determination on the approvability of any major proposed construction and provide an opportunity for public comment on that determination. In addition, the Clean Air Act requires that if an air quality model not listed in the EPA Guideline on Air Quality Models is used in the PSD permit application, the same opportunity for public comment must be afforded before the non-guideline model can be accepted. Enclosed, for your information, is a copy of EPA's preliminary determination analysis document on the ARCO Alaska, Inc. application for approval to modify the production facilities at Kuparuk, Alaska. Also enclosed is a copy of the notice which we expect will be published in the Fairbanks "News Miner" and the Anchorage "Times" on 12 NOV 1981. The notice briefly outlines EPA's preliminary determination and lists locations where the application for modification and the preliminary determination document may be reviewed.

Following publication of the notice, written public comments will be accepted by EPA for 30 days. A copy of all comments received will be forwarded to you immediately and will also be made available to the public at the locations listed in the notice. Additionally, a public hearing may be requested. A summary of comments made will be provided to you as soon as possible after a hearing. You may make a written response to EPA concerning any public comments made.

We will complete our final action on your application as quickly as possible after the close of the public comment period. A copy of the final determination document will be sent to you and will also be made available at the locations listed in the notice.

## CONCURRENCES

SYMBOL								
SJNAME								
LATE								



**STICK POSTAGE STAMPS TO ARTICLE TO COVER FIRST CLASS POSTAGE,  
CERTIFIED MAIL FEE, AND CHARGES FOR ANY SELECTED OPTIONAL SERVICES. (see 1)**

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3. If you want a return receipt, write the certified-mail number and your name and address on a return receipt card, Form 3811, and attach it to the front of the article by means of the gummed ends if space permits. Otherwise, affix to back of article. Endorse front of article **RETURN RECEIPT REQUESTED** adjacent to the number.
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5. Enter fees for the services requested in the appropriate spaces on the front of this receipt. If return receipt is requested, check the applicable blocks in Item 1 of Form 3811.
6. Save this receipt and present it if you make inquiry.



P15 3403971

# RECEIPT FOR CERTIFIED MAIL

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(See Reverse)

SENT TO				
P.B. Norgaard				
STREET AND NO.				
P.O. Box 360				
P.O., STATE AND ZIP CODE				
Anchorage AK 99570				
POSTAGE			\$	
CONSULT POSTMASTER FOR FEES	OPTIONAL SERVICES	CERTIFIED FEE		¢
		SPECIAL DELIVERY		¢
	RETURN RECEIPT SERVICE	RESTRICTED DELIVERY		¢
		SHOW TO WHOM AND DATE DELIVERED		¢
		SHOW TO WHOM, DATE, AND ADDRESS OF DELIVERY		¢
		SHOW TO WHOM AND DATE DELIVERED WITH RESTRICTED DELIVERY		¢
		SHOW TO WHOM, DATE AND ADDRESS OF DELIVERY WITH RESTRICTED DELIVERY		¢
	TOTAL POSTAGE AND FEES			\$
POSTMARK OR DATE				



- 2 -

If you have any questions concerning the preliminary determination document, please call Michael Johnston of my staff at (206) 442-7176.

Sincerely,

/s/John R. Spencer

John R. Spencer  
Regional Administrator

Enclosures

cc: Scott Ronsio, ARCO

NYE:BI:10-15-81:(1614N)

## CONCURRENCES

SYMBOL	RCN	8	10/27/81	AS			
SJRNAME	NVE	JOHNSTON	POSS	SMITH	COATE		
DATE	10/15/81	10/20/81	PRO				



Mail Stop 521

4 NOV 1981

Mr. Stan Hungerford  
 Air Pollution Control Agency  
 State of Alaska  
 Department of Environmental Conservation  
 Pouch O  
 Juneau, Alaska 99811

Dear Mr. Hungerford:

Enclosed please find copies of materials pertaining to the proposed installation of additional gas-fired turbines and heaters at the Kupauk Oil Field. ARCO Alaska, Inc. is seeking approval from EPA to modify oil field facilities pursuant to the federal prevention of significant deterioration requirements of the Clean Air Act as amended August 7, 1977.

This material is provided for your review. We will fully consider your comments when the final determination is made. The Act provides that EPA make the application and our preliminary analysis of the proposed facility available for public inspection. In this regard, we ask that the enclosed materials be made available to the public for review for a period of at least 90 days. Copies of public comments on these materials received by our office will be forwarded to you for your review and for public display along with the enclosed materials. When EPA makes a final decision with respect to the proposal, a copy of that determination will also be sent to you.

If you have any questions concerning this matter, please contact Raymond Nye of my staff at (206) 442-7176.

Sincerely,

Michael M. Johnston, Chief  
 New Source Permits Section

## Enclosures:

Copy of EPA Preliminary Determination analysis document  
 Copy of Notice soliciting public comments  
 Copy of letter to app CONCURRENCES Notification of

SYMBOL	Preliminary Determination						
SJNAME	Smith						
DATE							



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

DATE: 10/81

SUBJECT: ACTION MEMORANDUM - Notice of Application of Construct and Preliminary Determination, ARCO Alaska, Inc., Kuparuk, Alaska

FROM: Alexandra B. Smith, Director *Alex*  
Air and Hazardous Materials Division (M/S 529)

TO: John R. Spencer  
Regional Administrator (M/S 601)

Discussion

On May 11, 1981, EPA received from ARCO a completed PSD application requesting approval to modify the existing oil field facilities at Kuparuk, Alaska by the installation of additional gas-fired turbines and heaters. The project is subject to PSD review for emissions for nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO), sulfur dioxide (SO<sub>2</sub>) particulate matter (PM), and hydrocarbons (VOC).

One point you should be made aware of is that the Industrial Source Complex (ISC) model, which is not yet officially considered a guideline model, was used for the air quality analysis in the technical review. While not listed in EPA's "Guideline on Air Quality Models", the ISC model is included in the Proposed Revisions to these guidelines which EPA published in October 1980. The ISC model was judged most suitable for this application as it is the only model which accounts for building-wake-induced downwash of pollutants, a potential problem at this facility.

Recommendation

The emission limits indicated in the preliminary determination reflect BACT. Construction of the project will not cause violation of the National Ambient Air Quality Standards or PSD air quality increments. The staff recommendation is that you sign the enclosed letter to Mr. Norgaard, the Notice of Application to Construct and the Preliminary Determination Document.



## UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

ACTION MEMORANDUM - Notice of Application of Construct and Preliminary Determination, ARCO Alaska, Inc., Kuparuk, Alaska

Alexandra B. Smith, Director  
Air and Hazardous Materials Division (M/S 529)

John R. Spencer  
Regional Administrator (M/S 601)

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## CONCURRENCES

SYMBOL	NVE							
SURNAME	NVE	JOHNSTON	POSS	SMITH	Alh			
DATE	10-15-81	10/19/81	10/26/81					



PRELIMINARY DETERMINATION DOCUMENT  
PREVENTION OF SIGNIFICANT AIR QUALITY DETERIORATION  
PROPOSED MODIFICATION OF THE KUPARUK OIL FIELD AT  
KUPARUK, ALASKA

SCOPE

This document, with the technical analysis, presents EPA's preliminary determination of approvability of the ARCO Alaska, Inc. (ARCO) proposal to modify the production facilities at the Kuparuk Oil Field at Kuparuk, Alaska under Title 1, Part C of the Federal Clean Air Act, "Prevention of Significant Deterioration of Air Quality" (PSD).

GENERAL INFORMATION

The Federal Clean Air Act requires review and approval of the construction or modification of major sources of air pollution to assure that the air quality in areas attaining National Ambient Air Quality Standards (NAAQS) is not deteriorated beyond allowable limits for any pollutants regulated by EPA as a result of increased emissions from such new or modified facilities.

Before an application to construct or modify a major stationary source can be approved, it must be demonstrated that the expected emissions of all regulated pollutants above the minimum level established by Section 169 of the Act will not exceed the following:

1. Emission limits achievable by the application of best available control technology (BACT).
2. National Ambient Air Quality Standards (NAAQS).
3. In the case of particulate matter (TSP) and sulfur dioxide (SO<sub>2</sub>), allowable air quality increments.

FINDINGS

ARCO proposes to construct additional facilities in the Kuparuk Oil Field by installing various turbines and heaters. The total rated capacity of the additional equipment is approximately 600,000 horsepower (HP) for the turbines and 1060 million BTU/hr for the heaters. All turbines and heaters will be fired by natural gas. The project is subject to review under the PSD requirements for nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO), particulate matter (PM), sulfur dioxide (SO<sub>2</sub>) and hydrocarbons (VOC). The proposed emission limitations for these pollutants are listed in the table below.



EMISSION LIMITATIONS

<u>Equipment</u>	<u>Pollutant</u>	<u>Tons/Year</u>	<u>Performance Limit</u>
Gas Turbines	NO <sub>x</sub>	14,454	100 (14.4/Y) ppm*
	CO	2,892	109 lb/10 <sup>6</sup> scf of fuel used
	PM	317	10% opacity
	SO <sub>2</sub>	73	
	VOC	53	
Process Heaters	NO <sub>x</sub>	308	0.08 lb/10 <sup>6</sup> BTU (a) 0.1 lb/10 <sup>6</sup> BTU (b)
	CO	72	0.018 lb/10 <sup>6</sup> BTU
	PM	63	
	SO <sub>2</sub>	13	
	VOC	1	

\*NO<sub>x</sub> emission factor for gas-fired turbines is modified by an efficiency factor (Y = manufacturer's rated heat rate at rated peak load) which cannot exceed 14.4 kilojoules/watt-hour. Based at 15% oxygen on a dry basis.

- (a) - Applies to units of 43 X 10<sup>6</sup> BTU/hr. or greater.  
 (b) - Applies to units of less than 43 X 10<sup>6</sup> BTU/M.

A detailed discussion of this determination as well as proposed record keeping requirements are contained in the Technical Analysis document.

An ambient air quality analysis demonstrates that emissions of NO<sub>x</sub>, CO, SO<sub>2</sub>, PM and VOC, as limited above, are not expected to cause or contribute to a violation of any NAAQS or PSD air quality increment. There are no PSD increments for the NO<sub>x</sub>, CO and VOC pollutants. The technical analysis document also identifies the specific impact of the proposal on the appropriate standards.

RECOMMENDATION

Based upon a review of the application, EPA finds that the proposed modification will not cause violations of a NAAQS or PSD air quality increments. The emission limits required above for NO<sub>x</sub>, CO, SO<sub>2</sub>, PM and VOC represent the best available control technology. Therefore, EPA proposes to approve ARCO's request to add gas-fired turbines and heaters to the oil field complex at Kuparuk, Alaska. Comments are requested from the interested parties and will be carefully considered when the final determination is made.



PRELIMINARY DETERMINATION DOCUMENT  
PREVENTION OF SIGNIFICANT AIR QUALITY DETERIORATION  
PROPOSED MODIFICATION OF THE KUPARUK OIL FIELD AT  
KUPARUK, ALASKA

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This document, with the technical analysis, presents EPA's preliminary determination of approvability of the ARCO Alaska, Inc. (ARCO) proposal to modify the production facilities at the Kuparuk Oil Field at Kuparuk, Alaska under Title 1, Part C of the Federal Clean Air Act, "Prevention of Significant Deterioration of Air Quality" (PSD).

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FINDINGS

ARCO proposes to construct additional facilities in the Kuparuk Oil Field by installing various turbines and heaters. The total rated capacity of the additional equipment is approximately 600,000 horsepower (HP) for the turbines and 1060 million BTU/hr for the heaters. All turbines and heaters will be fired by natural gas. The project is subject to review under the PSD requirements for nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO), particulate matter (PM), sulfur dioxide (SO<sub>2</sub>) and hydrocarbons (VOC). The proposed emission limitations for these pollutants are listed in the table below.

201-10-15-81-1614

CONCURRENCES

SYMBOL	<i>W</i>	To be Published	<i>AS</i>				
SURNAME	Nye	Johnston	Poss	Smith	Coate	Spencer	
DATE	10/15/81	10/20/81	10/26/81				



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# STATE OF ALASKA

## DEPT. OF ENVIRONMENTAL CONSERVATION

465-2666

JAY S. HAMMOND, GOVERNOR

POUCH 0 - JUNEAU 99811

September 1, 1981

Mr. G. Scott Ronzio  
ARCO Alaska, Incorporated  
P.O. Box 360  
Anchorage, Alaska 99510

Certified Mail  
Return Receipt Requested

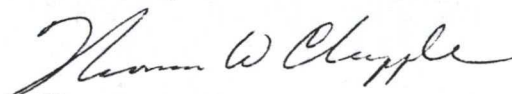
Dear Mr. Ronzio;

The enclosed document presents the Department's findings and concerns regarding the document entitled PSD Permit Application for New Sources to be Added to the Kuparuk Alaska Oil Field dated 30 April 1981 as submitted to the Department by ARCO Alaska, Inc.. Upon review of the document, Areas of primary concern have been identified as the use of an unapproved air quality model and the discussion and ultimate use of Best Available Control Technology for gas turbines at the proposed facilities.

For purposes of acquiring the necessary State permits, the following information must be submitted to the Department:

1. A request for State permits or amendments to existing permits on a signed application form that refers to the equipment at each location.
2. An indication that all proposed emission sources will comply with all applicable state air quality standards and regulations.

Sincerely,



Thomas W. Chapple  
Environmental Engineer III

enclosure

cc: Doug Lowery - NRO, Fairbanks  
Michael Johnston -EPA, Seattle ✓

RECEIVED  
SEP 14 1981  
PERMITS BRANCH  
EPA - REGION 10



REVIEW OF APPLICATION  
FOR  
PREVENTION OF SIGNIFICANT DETERIORATION PERMIT  
ARCO ALASKA INC.  
KUPARUK ALASKA OIL FIELD PROJECT  
Submitted  
30 April 1981

The Alaska Department of Environmental Conservation air quality section has reviewed the document entitled PSD Permit Application for New Sources to be Added to the Kuparuk, Alaska Oil Field dated 30 April 1981 as submitted to the Department by ARCO Alaska, Inc.. The Department's specific comments regarding the application are listed below.

The most significant shortcoming of the application is found to be the use of an air quality model and associated analytical techniques which are not approved for general use at this time since field testing, debugging and final EPA certification has not been completed. Since this certification procedure has not been completed, uncertainties remain as to the most likely air quality impacts of these proposed facilities at the Kuparuk Oil Field.

Because of the similarities between emission source type and total nitrogen oxides emission quantities of the proposed Kuparuk Oil Field facilities and some of the facilities at the adjacent Prudhoe Bay Oil Field which have been modeled with an approved air quality model, the report entitled Air Quality Impacts of the Prudhoe Bay Unit PSD-IV Sources as Estimated by the Texas Climatological Model (TCM-1) is useful in illustrating a comparison of air quality impacts of the two models. The TCM model has projected annual nitrogen dioxide impacts which are less than those projected for the similar Kuparuk facilities. Hence, it appears for this specific case that the unapproved model may be overly conservative in projecting ambient nitrogen dioxide impacts.

- (a) Within Section 4.4, Existing Air Quality, a statement should be made to qualify the ambient air quality and meteorological monitoring data as being representative of existing conditions in the year previous to submittal of the PSD application.
- (b) The Best Available Control Technology discussion as presented in Section 5 for gas turbines is insufficient with respect to its presentation of recent technological developments of "dry controls" for nitrogen oxides emissions from gas turbines. The document entitled General Electric Company's Draft Final Report (June 1981) on Low NO<sub>x</sub> Heavy Fuel Combustor Concept Program Phase I submitted 28 August 1981 by ARCO Alaska Inc. for purposes of the Prudhoe Bay Oil Field activities discusses several "dry control" turbine



designs which are currently being investigated at the research level. This report presents design concepts which may in the future (approximately 3 to 10 years), be incorporated into general use turbines which would achieve a reduction from current NO<sub>x</sub> emission rates. It would be desirable to obtain additional information concerning turbine designs currently being tested and which may be introduced in the market within the next 3 years.

- (c) On page 38 of the document, the New Source Performance Standard of 150 ppmv NO<sub>x</sub> for gas turbines is referenced as a proposed standard dated in September 10, 1979 Federal Register. The proper reference for this standard is 40CFR 60.332(d) for turbines of 107.2 gigajoules per hour or greater, while new turbines of 10.7 gigajoules per hour but less than 107.2 are exempt until October 2, 1982 (40CFR60.332(e)).
- (d) Chapter 6 of the report presents air quality impacts as estimated by the use of the Industrial Source Complex (ISC) model. This model is described in the Proposed Revisions to EPA's Guideline on Air Quality Models dated October 1980. Problems associated with the use of, and the results projected by, this model are identified below.
  - (i) Criteria for acceptable air quality models are specified in 40 CFR 52.21 (m) (1) for new sources to be constructed in areas classified for the Prevention of Significant Deterioration. The regulation states "All estimates of ambient concentrations required under this section shall be based on the applicable air quality models, data bases, and other requirements specified in the Guideline on Air Quality Models (OAQPS 1.2-080, U. S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, N.C. 27711, April 1978). Paragraph (m) (2) of the same regulations stipulates that an applicant may utilize a modification of a current model or substitute a different model that may be more appropriate if the modification or model has been subject to public review and approved by the Administrator of the USEPA. These regulations clearly suggest that it is the applicant's responsibility to select a model best suited to the specific conditions which are to be modeled. However, because the ISC model is not contained in the 1978 Guideline on Air Quality Models nor have the 1980 proposed revisions to the guideline been approved by the Administrator, use of the model at this time, is not acceptable for estimating air quality impacts of these proposed activities (FR 3-27-80, p. 20158).
  - (ii) Regardless of the status of this model's acceptance, the fundamental and optional algorithms of the ISC model must be compared with those of an approved model (ie. the Texas Climatological Model previously used for analyzing Prudhoe Bay projects) as outlined in the Workbook for Comparison of Air Quality Models, May 1978 (EPA - 450/2-78-028a).



- (iii) Utilization of the building wake option of the ISC model for 100% of the time in predicting annual ambient exposures is certainly a conservative but probably not a valid assumption for simulating actual field conditions. It may however be applicable and very informative for projecting ambient impacts where exposure times are 24 hours or less (ie. 24 hr. TSP, 3 hr. and 8 hr. SO<sub>2</sub>) or possibly identifying physical locations which may exhibit high nitrogen dioxide concentrations for short exposure times. If the short-term nitrogen dioxide concentrations are found to be sufficiently high (say, 5 to 10 times the annual standard) because of stack downwash, then it would be warranted to investigate through the annual meteorological data the relative frequency and persistence of this occurrence.
- (e) The ozone limiting method for projecting annual nitrogen dioxide concentrations is a technique contained in the proposed revisions to the Guidelines on Air Quality Models. At this time, this is an unacceptable technique for reasons stated in (d).
- (f) The ozone impact assessment as presented in Section 6.2.4 of the document is a reasonable and appropriate manner of addressing the likelihood of significant ozone generation due to anthropogenic hydrocarbon emission sources in consideration of the climatological conditions characteristic of the north slope of Alaska.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

*Johnston*  
*Nip*

DATE: August 26, 1981

SUBJECT: PSD Technical Analysis-Arco-Kuparuk, Alaska

FROM: Robert G. Courson, Chief *RGC*  
Technical Support Branch (M/S 329)

TO: Harold Geren, Chief  
Permits Branch (M/S 521)

Attached is a copy of our Technical Analysis for Prevention of Significant Deterioration for the oil field sources proposed by Arco at Kuparuk, Alaska.

Most of the results of the air quality analysis for this technical review were based on the Industrial Source Complex (ISC) Model. The ISC model is technically a non-guideline model. The model was judged to be the most appropriate model available for this air quality review. Therefore, the model was used in this air quality analysis and public comments concerning the use of the model should be invited. No other issues arose in the air quality analysis or BACT review.

If you have any questions concerning the air quality analysis, contact Bill Puckett or concerning BACT, contact Dave Tetta.

Attachment

**RECEIVED**  
AUG 27 1981  
PERMITS BRANCH  
EPA - REGION 10



Technical Analysis for  
Prevention of Significant Deterioration  
ARCO Alaska, Inc.--Kuparuk, Alaska  
August 26, 1981

1.0 Introduction

ARCO Alaska, Inc., a subsidiary of Atlantic Richfield Company, proposes to construct additional facilities at the Kuparuk, Alaska Oil Field. These consist of additional drill sites, an expansion of the existing Central Production Facility (CPF), other production facilities, water injection facilities, additional power production capacity, and a crude oil topping unit. Emission sources for these facilities consist of 47 turbines with a combined capacity of 600,000 horsepower, 100 heaters with a combined heat input rate of 1060 MM Btu/hr, and a crude oil topping unit flare. A breakdown of the proposed emission sources is presented in Table 1-1.

The total projected emissions increases, in tons per year, from the project are summarized below:

<u>Pollutant</u>	<u>Emissions</u>	<u>EPA Significant Emissions Level</u>
NO <sub>x</sub>	15,402	40
PM	373	25
CO	3,006	100
SO <sub>2</sub>	99	40
VOC	64	40

TABLE 1-1  
PROPOSED FACILITIES SOURCE LIST

<u>Location</u>	<u>Description</u>
Central Production Facility	3-14 MHP Turbines 8-34 MHP Turbines 21-10 MMBtu/hr Heaters* Crude Oil Topping (COT) Unit Flare 1-40 MMBtu/hr COT Heater
West Production Facility	8-4.9 MHP Turbines 4-14 MHP Turbines 25-10 MMBtu/hr Heaters* 1-20 MMBtu/hr Heater
North Production Facility	8-4.9 MHP Turbines 4-14 MHP Turbines 25-10 MMBtu/hr Heaters* 1-20 MMBtu/hr Heater



## South Production Facility

8-49 MHP Turbines  
4-14 MHP Turbines  
25-10 MMBtu/hr Heaters\*  
1-20 MMBtu/hr Heater

- 
- \* The 10 MMBtu/hr heaters are assigned to the production facilities for dispersion modeling purposes. In actuality, they will be constructed at sites throughout the Kuparuk Oil Field, yet to be determined.

As shown in the above table, projected emissions of NO<sub>x</sub>, PM, CO, SO<sub>2</sub>, and VOC are above the significant emissions levels for modified sources as defined in §52.21(b)(23)(i) of the PSD regulations. Therefore, a BACT determination and air quality analysis will be required for NO<sub>x</sub>, PM, CO, and SO<sub>2</sub>. Air quality review is not required for VOC because VOC emissions are less than 100 tons per year, however, a BACT determination must still be made for VOC.

### 2.0 Determination of Best Available Control Technology (BACT)

#### 2.1 Definition

BACT defines an emission limitation based on the maximum degree of reduction achievable through application of process modifications and emission control systems. BACT is determined on a case-by-case basis taking into account energy, economic, and environmental impacts. BACT emission limits must not exceed New Source Performance Standards (NSPS) proposed or promulgated under 40 CFR Part 60.

#### 2.2 BACT for the Turbines

##### 2.2.1 NO<sub>x</sub> and CO

Standards of Performance for Stationary Gas Turbines were promulgated on September 10, 1979, for NO<sub>x</sub>. These standards limit NO<sub>x</sub> emissions from turbines used for oil or gas transportation and production to 150 ppm at 15 percent oxygen on a dry basis. The NO<sub>x</sub> emission limit for gas turbines is modified by a turbine efficiency factor, and the source test results must be adjusted to (ISO) standard day conditions.

The two best systems available for reduction of NO<sub>x</sub> from combustion turbines are dry (internal combustion) controls and injection of water or steam. Dry controls are incorporated into the design of the turbine combustion chamber by the manufacturer. Water or steam injection lowers the peak combustion temperature in the turbine and, therefore, reduces the amount of NO<sub>x</sub> formed. NO<sub>x</sub> emissions of less than 75 ppm at 15 percent oxygen can be achieved with water or steam injection.



Water or steam injection to limit NO<sub>x</sub> emissions is infeasible at the Kuparuk operation primarily because of its geographic location. Alaska's North Slope has a shortage of fresh water, a fragile environment, and is extremely cold during much of the year. Fresh water must be used for turbine injection and requires carefully monitored pH and extremely low minerals and dissolved and suspended solids contents. The cost for facilities to produce water of this quality would be prohibitive for ARCO Alaska, Inc. In addition, the available fresh water in this region is often frozen and contains a relatively high concentration of dissolved solids and related impurities. Alaska also has strict laws regulating commercial water use in order to protect fish and wildlife. These problems would have to be overcome before water injection could be considered. The cost to ARCO Alaska, Inc., would be much greater than that typical for the "lower 48," due to the required storage of water for use during low flow periods, installation of water treatment facilities, and increased energy costs to keep the water from freezing during cold periods.

Dry controls can reasonably be expected to limit NO<sub>x</sub> emissions to the NSPS value of 150 ppm at 15 percent O<sub>2</sub>. There is some evidence indicating that even lower levels are achievable using dry controls. One manufacturer plans to guarantee a NO<sub>x</sub> emission level of less than 100 ppm using dry controls for turbines greater than 40 MHP. The turbine at Alyeska pump station No. 2 was source tested in 1980 and found to emit about 80 ppm NO<sub>x</sub>. A number of the gas turbines at Prudhoe Bay have been tested for NO<sub>x</sub> emissions. The test results showed NO<sub>x</sub> emissions of 40-80 ppm. However, this set of data does not justify a lower emission limit, and so 150 ppm is still considered BACT.

Incomplete combustion is the primary cause of carbon monoxide (CO) emissions from stationary gas turbines. CO emissions can best be reduced by maintaining proper combustion conditions by regulating fuel to air ratios, mixing, and combustion temperatures. Since documented evidence is unavailable to indicate that better control is available for CO emissions, the emission limitation based upon natural gas as the fuel and representative of BACT for CO is calculated to be 109 lb/MM scf of fuel used.

#### 2.2.2 PM, SO<sub>2</sub> and VOC

No effective controls have been demonstrated for reducing PM emissions from gas turbines. Therefore, a level of emissions equal to that specified in the AP-42 emission factors is judged to represent BACT. For 600 MHP of turbine capacity, this level corresponds to PM emissions of 373 tons per year.

The company proposes to control SO<sub>2</sub> emissions from the turbines by limiting the H<sub>2</sub>S concentration of the fuel gas to 20 ppm. This will result in an outlet concentration well



below the NSPS limit for gas turbines of 150 ppm. Therefore, this level of SO<sub>2</sub> control is considered BACT. This corresponds to SO<sub>2</sub> emissions of 73 tons per year.

No effective controls have been demonstrated for reducing VOC emissions from gas turbines. Therefore, a level of emissions equal to that specified in the AP-42 emission factors is considered to represent BACT. For 600 MHP of turbine capacity, this corresponds to VOC emissions of 53 tons per year.

## 2.3 BACT for the Process Heaters

### 2.3.1 NO<sub>x</sub> and CO

For the process heaters, BACT Must be determined for NO<sub>x</sub> and CO. NSPS regulations for process heaters have not been proposed or promulgated as of this time. However, the NSPS for fossil fuel fired steam generators will be used for comparison. These regulations include an NO<sub>x</sub> emission limit for gas-fired units of 0.20 lb NO<sub>x</sub>/MM BTU and a 25 percent reduction from potential emissions for fossil fuel fired steam generators with a capacity greater than 250 x 10MM BTU/hr. Although none of the proposed heating units have a capacity greater than 250 X MM BTU/hr, this NSPS will be used as a comparison in the analysis that follows.

The company proposed to limit NO<sub>x</sub> by burning natural gas. Other NO<sub>x</sub> reduction processes such as off-stoichiometric combustion, minimizing excess air to the combustion process, and flue gas recirculation were considered but rejected either because of the remoteness of the source or the relatively small size of the process heaters.

Low NO<sub>x</sub> burners reduce NO<sub>x</sub> emissions by improved fuel-air mixing, lower peak flame temperatures, oxygen deficient combustion, and flue gas recirculation. These burners have been shown to reduce emissions to the range of 40-75 ppm which represents a 60-75 percent reduction from the maximum AP-42 emission factor. These burners can reasonably be expected to reduce NO<sub>x</sub> emissions to less than 70 ppm or 35 ng/J (.08 lb MM BTU). The use of low NO<sub>x</sub> burners on process heaters would result in a substantial decrease in emissions over natural gas firing alone. Low NO<sub>x</sub> burners should not require dramatically increased upkeep or initial capital costs over other types of burners; therefore, BACT for the process heaters will be set at .08 lb NO<sub>x</sub>/10<sup>6</sup> BTU (35 ng/J) for heaters rated at 43 MM BTU/Hr or greater.

For heaters with a capacity of less than 43 MM BTU/Hr., low NO<sub>x</sub> burners are also considered BACT. But the emission for these heaters should be slightly higher. This takes into account the higher oxygen levels for natural draft systems, which the smaller heaters could be expected to use.



Assuming 4% excess oxygen, an emission limit of 0.1 lb/MM BTU is considered BACT for heaters rated at less than 43 MM BTU/Hr.

CO from process heaters are minimized by burning gas rather than oil and by monitoring combustion parameters to maintain good combustion. Either oxygen or carbon monoxide levels in the combustion flue gas can be used as an indicator of good combustion; therefore, the installation of either continuous CO or O<sub>2</sub> monitors or the implementation of an acceptable periodic monitoring program will be required for all of the process heaters. CO or O<sub>2</sub> monitoring and gas firing will be considered BACT for the process heaters. The CO emission limit for the process heaters is based upon the use of natural gas as the fuel and is calculated to be 0.018 lb/MM BTU.

#### 2.3.2 PM, SO<sub>2</sub> and VOC

No effective controls have been demonstrated for reducing PM emissions from process heaters. Therefore, a level of emission equal to that specified in the AP-42 emission factors is judged to represent BACT. For 1060 MM BTU/hr of heater capacity, this level corresponds to PM emissions of 63 tons per year.

The company proposes to control SO<sub>2</sub> emissions from the heaters by limiting the H<sub>2</sub>S content of the fuel gas to 20 ppm. No effective controls have been demonstrated for achieving lower SO<sub>2</sub> emission levels. Therefore, this level of control is considered BACT. This corresponds to annual emissions of 13 tons per year.

No effective controls have been demonstrated for reducing PM emissions from process heaters. Therefore, a level of emission equal to that specified in AP-42 is considered to represent BACT. This corresponds to VOC emissions of one-ton per year.

#### 2.4 BACT for the COT Flare

The company proposes to limit the online time of the COT Flare to emergency use only (1 percent of total operating time). Therefore, no BACT analysis is required for this unit.

#### 3.0 Ambient Air Quality Analysis

From the information given in the previous section, operation of the proposed additional facilities at the Kuparuk, Alaska Oil Field will result in significant increases of emissions of the following pollutants: Oxides of nitrogen (NO<sub>x</sub>), particulate matter (PM) carbon monoxide (CO), volatile organic compounds (VOC), and sulfur dioxide (SO<sub>2</sub>). PSD regulations require that an ambient air quality



analysis must be conducted for each of these pollutants except for VOC. Regulations require air quality review for O<sub>3</sub> (ozone) only if VOC emissions increases are 100 tons/year or more. According to PSD regulations the company must demonstrate through an approved air quality analysis that the proposed project will not result in exceedances of any applicable National Ambient Air Quality Standards (NAAQS) or applicable PSD increments. The air quality analysis may also show that addition of the proposed sources will result in increases of ground-level pollutant concentrations that are less than EPA Levels of Significant Ambient Impact (LSI), which would mean that further air quality review would not be necessary. The applicable NAAQS, PSD increments, and LSI are listed in Table 3-1.

### 3.1 Existing Conditions

Additional facilities will be constructed to continue the development of the Kuparuk Oil Field. The Kuparuk Oil Field is an onshore oil field located on the North Slope of Alaska. The proposed oil field area will cover about 210 square miles. The center of the oil field will be located about 40 kilometers (Km) west of the Prudhoe Bay Oil Field, about 175 Km east-southeast of Barrow, Alaska and 16 Km south of Harrison Bay on the Beaufort Sea.

The topography and land use of the Kuparuk area are nearly identical to that of the Prudhoe Bay area, which is characterized by relatively flat terrain that gradually slopes downward from the foothills of the Brooks Mountains to the coast of the Arctic Ocean.

A one-year (April 1, 1979 to March 31, 1980) air quality and meteorological monitoring program was conducted in the Prudhoe Bay area. Data from this monitoring study showed the Prudhoe Bay area to be in compliance with all NAAQS. This monitoring study is described in the Arco/Sohio PSD IV, PSD Application. It also can be concluded from this study that air quality levels in the Kuparuk area are in compliance with all NAAQS because the Kuparuk Oil Field is located in a remote area only 40 Km from the existing Prudhoe Bay facilities. For this reason, the background air quality pollutant levels measured in the Prudhoe Bay area are considered to be representative of the Kuparuk area. These background levels can be used in this air quality analysis, if all of the existing, previously permitted, and proposed Kuparuk and Prudhoe Bay sources are included in the air quality analysis. The background pollutant levels used in the air quality analysis are listed in Table 3-1.

The Kuparuk area has a very harsh, Arctic climate characterized by extremely cold winters and very cool summers. Dispersion conditions in the area are generally good, primarily because of the good ventilation provided by frequent moderate to strong winds. Poor dispersion conditions do occur during stable conditions when winds are very light, but periods of poor dispersion are not frequent. This becomes evident by an investigation of Table 4-1 of the addendum to the Arco/Sohio PSD IV PSD Application which shows that extremely stable (Class F) conditions occur only 5.8 percent of the time in the Prudhoe Bay area and slightly stable (Class E) conditions occur only 7 percent of the time.



Meteorological data used in the air quality analysis was obtained from the Prudhoe Bay Monitoring Study. A detailed description of the monitoring study and the methodology used in processing the data for use in dispersion modeling is contained in the Arco/Sohio PSD IV, PSD Technical Analysis Document. The meteorological data gathered in the Prudhoe Bay area is considered to be representative of dispersion conditions in the Kuparuk area because of the close proximity of the two oil fields (the Kuparuk Area Central Production Facility is 36 Km west-northwest of Prudhoe Bay Well Pad A) and because of similarities in terrain between the two areas. A comparison of the wind rose for Well Pad A (Monitor Site 1) shown in Figure 3-1 with the 1976 wind rose for Deadhorse Airport (15 km southeast of Monitor Site 1) and the 1958-1964 and 1968-1977 wind roses for Barter Island (220 km east of Monitor Site 1) show that wind speeds and wind directions measured at Monitor Site 1 are representative of regional climatic conditions. Therefore, the Prudhoe Bay meteorological data was considered to be appropriate for this air quality analysis.

For short-term modeling, pre-processed hourly meteorological data from the Prudhoe Bay monitoring network were used. For annual modeling, a joint frequency distribution of wind speed, wind direction, and stability class was developed from the one year of hourly data and was used as meteorological input. Both wind speed and wind direction data from Monitor Site 1 were used in the air quality analysis.

Mixing heights computed from the modified PREP pre-processor program were used in the air quality analysis for the entire monitoring study period except for Oct. 2, 1979 through Feb. 2, 1980. Mixing height data collected by an acoustic sounder was used during this time period. For a detailed description of the acoustic sounder refer to the Air Quality and Meteorological Monitoring Study at Prudhoe Bay, Alaska, Jan., 1981, and for a description of the modified PREP pre-processor program refer to the Prudhoe Bay Unit Owners' Waterflood PSD Application.

### 3.2 Emission Characteristics

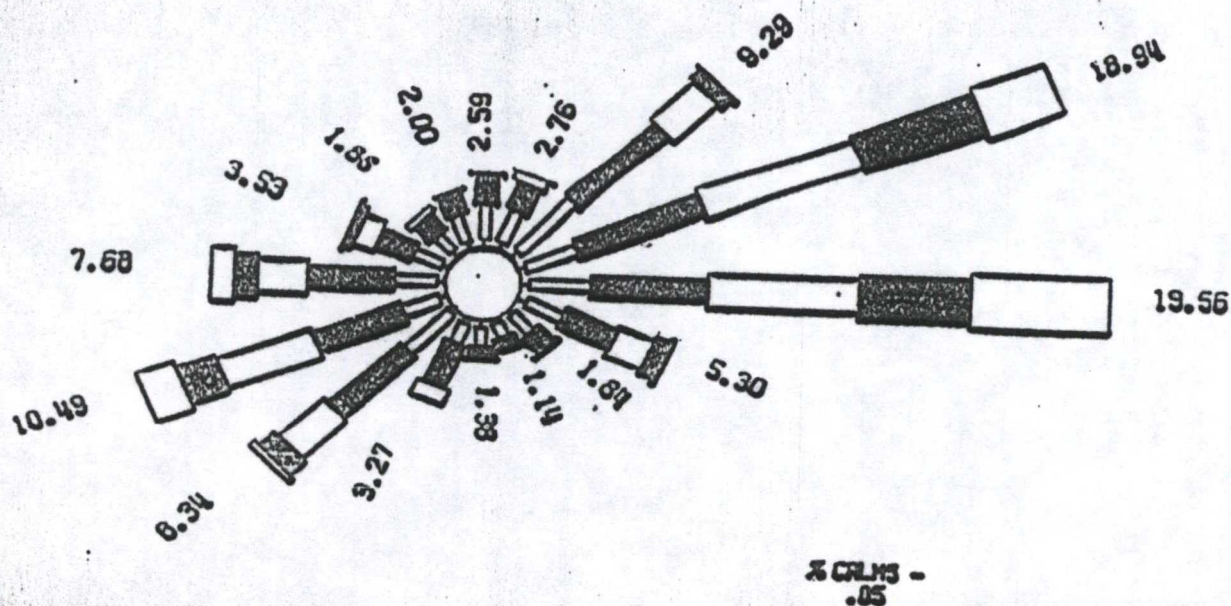
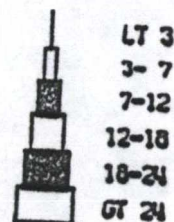
The stack parameters and pollutant emission rates for all existing, previously permitted, and proposed sources in the Kuparuk and Prudhoe Bay areas which were used in the air quality analysis are listed in Appendix A of the Arco-Kuparuk PSD Application.

Most of the proposed Kuparuk sources will have stack heights less than good engineering practice (GEP) stack heights as determined by the proposed EPA regulations (Federal Register, Vol. 44, No. 9, Jan. 12, 1979). High ground-level pollutant concentrations can result from pollutant emissions from stacks of heights less than GEP recommended heights due to building-wake-induced downwash of pollutants. Consequently, downwash was considered in the modeling analysis for all proposed, existing, and previously permitted Kuparuk and Prudhoe Bay sources which have stack heights lower than GEP recommended heights. The modeling approach used in the downwash analysis is described in the next subsection.



# WIND ROSE APRIL 1, 1979 - MARCH 31, 1980

WIND SPEED  
(MPH)



PRUDHOE BAY - WELL PAD A  
(MONITOR SITE 1)

Figure 3-1



## Model Methodology

The proposed Kuparuk sources were modeled with existing, previously permitted, and proposed sources in the Kuparuk and Prudhoe Bay areas to determine compliance with NAAQS. To determine compliance with PSD increments, all increment-consuming sources were modeled together. Increment-consuming sources are defined as all sources constructed or permitted after the baseline date for a particular pollutant. Baseline dates are pollutant-specific and are established for an area by the date after August 7, 1977 that the first completed PSD application for a major modification or major stationary source subject to EPA's PSD regulations as amended on August 7, 1980 is submitted. The complete application receipt date is the baseline date for each pollutant which is emitted in greater than significant amounts. The baseline date for PM was set on Nov. 13, 1978 by the Prudhoe Bay Unit Owners PSD I Application, and the baseline date for SO<sub>2</sub> was set on April 2, 1981 by the Prudhoe Bay Unit Owners PSD IV Application.

In this air quality analysis the proposed Kuparuk sources of PM and SO were modeled as increment-consuming sources, while existing and previously permitted Kuparuk sources are not considered increment-consuming sources.

Short-term modeling was done through the use of the rural version of the Industrial Source Complex Short-Term (ISCST) Model and the PTPLU Model. Long-Term modeling was done through the use of the rural version of the Industrial Source Complex Long-Term (ISCLT) Model. The short-term and long-term versions of the ISC Model are described in detail in the Industrial Source Complex (ISC) Dispersion Model User's Guide, Vol. 1, EPA-450/4-79-030, Dec., 1979. The PTPLU Model is described later in this subsection. The use of the rural version of the ISC Model rather than the urban version of the model is based on a classification scheme described in "Guidelines on Air Quality Models," Proposed Revisions, EPA, Oct., 1980. The scheme allows an area to be classified urban or rural based on land use.

The ISC Model is not listed as a recommended model in EPA's "Guideline on Air Quality Models" (EPA-450/2-78-027, April, 1978) which is currently in force. However, the ISC Model has been proposed as a guideline model and is included in the "Regional Workshops on Air Quality Modeling - A Summary Report," April, 1981.

At this time, the ISC Model has not been thoroughly evaluated and it is still being tested. One evaluation study has shown that for plumes subject to building-wake effects, the building-wake-effects option of the ISC Model significantly improves the performance of the ISC Model over that of the corresponding models (CRSTER and MPTER), which do not consider building-wake effects when used to calculate concentrations near the source. Data sets in this study were not sufficient in number and detail to validate new features of the model, however, it was possible to compare the performance of the ISC Model with the CRSTER and MPTER models. This study is described in detail in "An Evaluation Study for the Industrial Source Complex (ISC) Dispersion Model," EPA-450/4-81-002, Jan., 1981.



The ISC Model was used in this air quality analysis because building-wake-induced downwash of pollutants was viewed as a potential problem, and the ISC Model is the most suitable available model for use in calculating downwash of pollutants. The model was also judged to be appropriate for use in the Kuparuk/Prudhoe Bay area because the terrain of the area is relatively flat. Since ISC is technically a non-Guideline Model, EPA hereby approves of its use for this application. EPA regulations require that notice and opportunity for public comment be given on this proposed approval.

Pre-processed hourly meteorological data collected in the Prudhoe Bay Monitoring Study were input into the ISCST Model. The annual stability wind rose constructed from the Prudhoe Bay Monitoring Study was used as meteorological input for long-term modeling with ISCLT.

The modeling approach used in determining compliance with PSD increments and NAAQS for each pollutant subject to air quality review follows:

#### 3.3.1 NO<sub>2</sub>

A screening analysis with ISCST was performed for the proposed Kuparuk Oil Field sources and for all Prudhoe Bay sources. All existing and proposed Kuparuk emission sources were assumed to be distributed equally and colocated at the four Kuparuk Oil Field production facilities. This assumption could lead to overpredictions of ground-level NO<sub>x</sub> concentrations. The locations of the four Kuparuk Oil Field production facilities are shown in Figure 3-2. Pollutant sources at Prudhoe Bay were also included in this analysis. An 8 by 5 receptor grid with a 0.25 Km spacing was modeled around each facility. This analysis revealed that annual NO<sub>x</sub> concentrations from the proposed Kuparuk sources exceeded significant levels at receptors located in the Prudhoe Bay Oil Field. The analysis also showed the Prudhoe Bay sources to have significant impacts at receptors located in the Kuparuk Oil Field. Therefore, ISCLT modeling runs were performed for all Prudhoe Bay and Kuparuk sources of NO<sub>x</sub>. From these runs four areas of maximum impact were identified for more refined modeling. These "maximum impact areas" were located around the Central Processing Facility (CPF) and the Southern Processing Facility (SPF) in the Kuparuk Oil Field, and around Gathering Center 2 (GC-2) and Flow Station 1 (FS-1) in the Prudhoe Bay area. The locations of the proposed Kuparuk sources are shown in Figure 3-2. The locations of the Prudhoe Bay facilities are shown in Figure 1 of the Arco/Sohio PSD IV, PSD Technical Analysis Document.

The Ozone Limiting Method was used in the refined modeling analysis to determine maximum annual NO<sub>2</sub> concentration levels from the predicted NO<sub>x</sub> concentrations. This method is described in a paper titled "A Review of Techniques Available for Estimating Short-Term NO<sub>2</sub> Concentrations,"



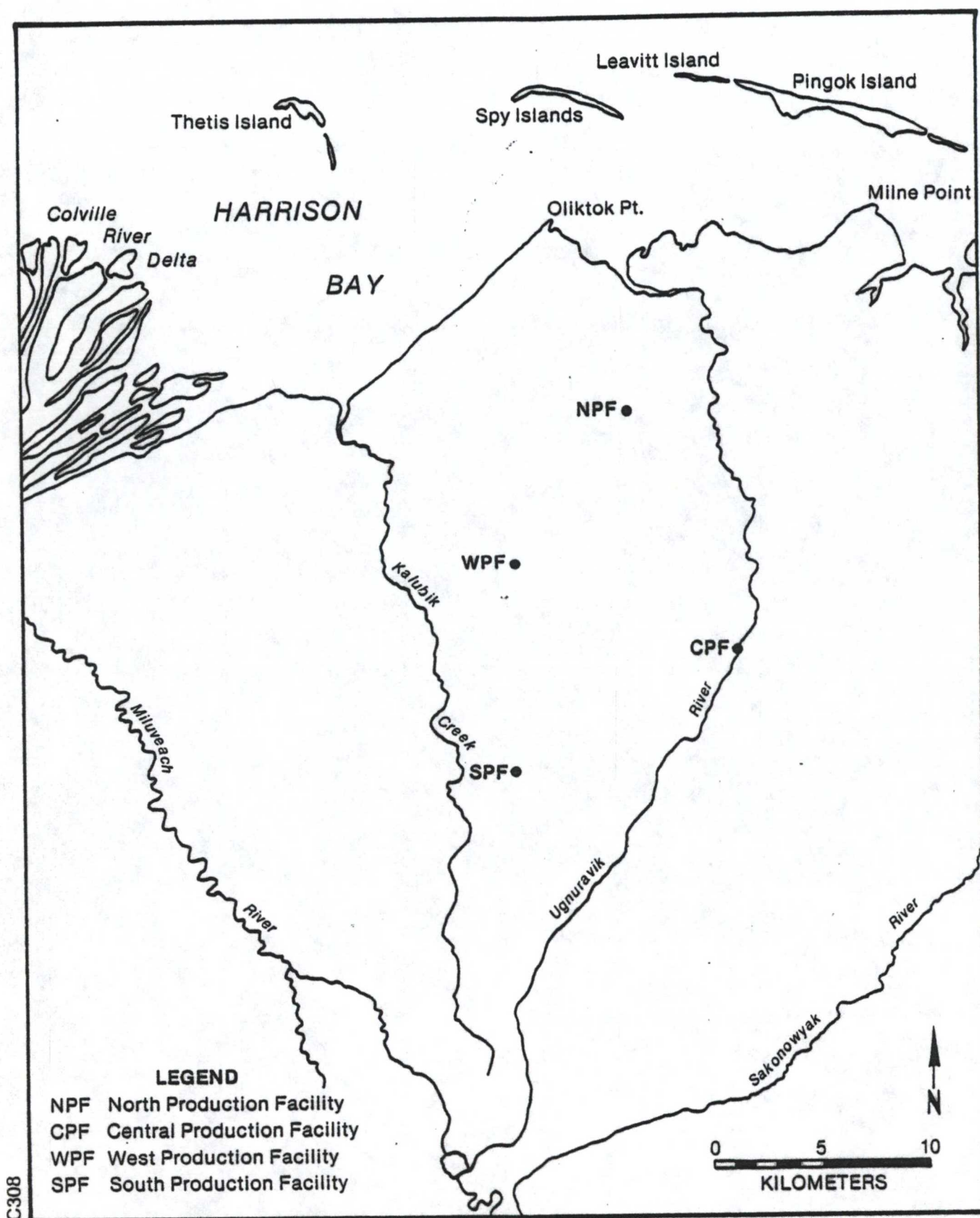


Figure 3-2. Location of Proposed Facilities in the Kuparuk Area



Cole and Summerhays, 1979. This method assumes that 10 percent of the oxides of nitrogen ( $\text{NO}_x$ ) emitted is converted "in-stack" to  $\text{NO}_2$ . The remaining 90% of the  $\text{NO}_x$  emitted is oxidized to  $\text{NO}_2$  by the available atmospheric  $\text{O}_3$  present. The amount of  $\text{NO}_2$  formation is restricted by the amount of  $\text{O}_3$  present. The background  $\text{O}_3$  concentration of  $51 \text{ ug/m}^3$  was used in this analysis because it was assumed that existing Prudhoe Bay and Kuparuk sources did not contribute to the ambient  $\text{O}_3$  concentration.

To determine compliance with NAAQS, the maximum  $\text{NO}_2$  concentrations predicted by the above method were added to the background  $\text{NO}_2$  levels. The results of this analysis are listed in the next subsection.

### 3.3.2 CO

CO emissions from the proposed Kuparuk Oil Field sources were modeled through the use of the EPA PTPLU Model. The model calculates maximum downwind pollutant concentrations along the plume centerline for an array of wind speeds and stability classes. The output consists of the maximum one-hour concentration for each wind speed and stability combination and the distance from the source at which it occurs. The maximum CO concentrations predicted for each source were added together to determine the maximum one-hour CO impact. This modeling approach will likely result in the overprediction of ground-level CO concentrations for the following reasons: 1) Maximum concentrations were assumed to occur at the same receptor. 2) Maximum concentrations were summed without consideration given to differences in the wind speed and stability class associated with each individual maximum.

The maximum 8-hour CO concentration was obtained by multiplying the maximum one-hour CO impact by 0.7. This methodology is in accordance with "Procedures for Evaluating Air Quality Impact of New Stationary Sources" (EPA-450/4-77-001). The maximum one-hour CO impact was considerably less than the one-hour LSI, however, the maximum 8-hour CO impact was slightly above the 8-hour LSI. Further air quality review was not conducted for CO because it was felt that the conservative assumptions mentioned above resulted in the overprediction of ground-level CO concentrations, which suggests that maximum CO concentration values would likely be below the LSI for the averaging times of concern. The results of this analysis are listed in the next subsection.

### 3.3.3 SO<sub>2</sub>

To determine short-term  $\text{SO}_2$  impacts from the Kuparuk facilities, emissions of  $\text{SO}_2$  were input into the ISCST Model. Receptors were placed in circular rings at distances of 0.25 Km, 0.5 Km, and 1.0 Km around the CPF and SPF.



Receptors were not placed around the remaining Kuparuk facilities because SO<sub>2</sub> emissions from these facilities were the same as SO<sub>2</sub> emissions from the SPF. Therefore, if SO<sub>2</sub> impacts from the SPF exceeded significance levels at the SPF, then significance levels would also be exceeded at the other facilities and additional modeling would be necessary around these facilities. This screening analysis showed that SO<sub>2</sub> concentrations would exceed 3-hour and 24-hour LSI around the CPF only. For this reason, additional modeling was conducted only around the CPF. The "worst-case" periods for 3-hour and 24-hour SO<sub>2</sub> impacts were identified from the screening analysis. More refined modeling was conducted around the CPF for these "worst case" periods. Receptors were only placed around the CPF in the refined short-term analysis.

The same screening technique for determining annual NO<sub>x</sub> and PM impacts from the Kuparuk facilities was also used for determining annual SO<sub>2</sub> impacts. The screening analysis showed that annual SO<sub>2</sub> impacts would exceed LSI around the CPF only. Refined modeling was performed around the CPF for an 8 by 5 receptor grid with a 0.25 Km grid spacing. All Kuparuk sources were included in the refined analysis.

The maximum SO<sub>2</sub> impacts from the proposed Kuparuk sources are compared to applicable PSD increments in the next subsection. To determine compliance with applicable NAAQS, the maximum SO<sub>2</sub> impacts from all Kuparuk sources were added to the SO<sub>2</sub> background levels. Results of this analysis are listed in the next subsection.

#### 3.3.4 PM

Throughout this analysis emissions and concentrations of particulates are expressed as particulate matter (PM). The same short-term screening technique was used in determining short-term PM impact areas and "worst case" days as was used in the short-term SO<sub>2</sub> screening analysis. This screening analysis showed that significant 24-hour PM impacts will occur near the four major Kuparuk facilities which are shown in Figure 3-2. In the refined analysis, 6 by 6 receptor grids with 0.1 Km grid spacings were placed around the areas of maximum impact determined from the screening analysis.

The same screening technique for determining annual NO<sub>x</sub> and SO<sub>2</sub> impacts from the proposed Kuparuk facilities was also used for determining annual PM impacts. The screening analysis showed annual PM impacts to be above the LSI around the four major Kuparuk facilities. No significant impacts from the Kuparuk facilities were predicted to occur in the Prudhoe Bay Oil Field area. Refined modeling with an 8 by 5 receptor grid and 0.25 Km spacing was conducted around each major Kuparuk facility.



Maximum PM impacts from the proposed Kuparuk sources are compared to applicable PM increments in the next subsection. Maximum PM impacts from all Kuparuk sources were added to PM background levels to determine compliance with applicable NAAQS. The results of this analysis are listed in the next subsection.

#### 3.4 Model Results

The maximum predicted concentrations for each pollutant are compared to applicable NAAQS, PSD increments, and LSI in Table 3-1.



TABLE 3-1

Comparison of Estimated Maximum Impacts from the  
Proposed Kuperuk Sources with Applicable National  
Ambient Air Quality Standards (NAAQS), PSD Increments,  
and Levels of Significant Ambient Impact (LSI).

All concentrations are in micrograms per cubic meter

<u>Pollutant</u>	<u>Averaging Time</u>	<u>Proposed Kuperuk Sources*</u>	<u>LSI</u>	<u>Class II PSD Increment</u>	<u>All Sources</u>	<u>Measured Background</u>	<u>Total</u>	<u>NAAQS</u>
SO <sub>2</sub>	3 hours	123	25	512	140	0	140	1,300
	24 hours	16	5	91	16	0	16	365
	Annual	2	1	20	2	0	2	80
PM	24 hours	26	5	37	26	11	37	150
	Annual	1	1	19	3	11	14	60
CO	1 hour	757	2,000	**	***	171	-	40,000
	8 hours	530	500	**	***	171	-	10,000
NO <sub>2</sub>	Annual	1	1	**	62	2	64	100

\* Proposed Kuperuk sources are increment-consuming sources, while existing and previously licensed Kuperuk sources are not increment-consuming sources.

\*\* No PSD increments exist for CO and NO<sub>2</sub>.

\*\*\* Further air quality review was not conducted because the conservative air quality analysis showed one-hour CO impacts to be well below the level of significant ambient impact.



#### 3.4.1 NO<sub>2</sub>

Maximum annual NO<sub>2</sub> concentrations are predicted by the ISCLT Model to occur at points of 0.25 Km to the lee side of the four major Kuparuk facilities and to the lee side of several of the Prudhoe Bay sources. This suggests that these concentration maxima are the result of building-induced downwash. The maximum annual NO<sub>2</sub> concentration occurred 0.25 Km to the west of GC-2 in the Prudhoe Bay Oil Field, while the second highest NO<sub>2</sub> concentration was predicted to occur 0.25 Km west of the CPF in the Kuparuk Oil Field. These predicted concentration values were 64 micrograms per cubic meter (ug/m<sup>3</sup>) and 58 ug/m<sup>3</sup> respectively - less than the annual NAAQS of 100 ug/m<sup>3</sup>. There exists some uncertainty whether these impacts would occur because the Prudhoe Bay and Kuparuk buildings are built on elevated structures, which may minimize the effects of building-wake-induced downwash. If downwash did not occur, model predictions would be overestimates in the lee of buildings. It should be noted, however, that the addition of previously permitted and proposed sources of NO<sub>x</sub> will result in a general significant increase (20 ug/m<sup>3</sup> to 30 ug/m<sup>3</sup>) in NO<sub>2</sub> levels in the Prudhoe Bay and Kuparuk areas. This is illustrated by comparing Figure 6-2 of this PSD application and Figure 4-1 of the Arco/Sohio PSD IV, PSD Application with Figure 9.2-3 of the Prudhoe Bay Unit Owner's PSD I Application.

#### 3.4.2 CO

The maximum CO impacts were determined for "worst case" meteorological conditions for all of the proposed Kuparuk sources. Table 3-1 shows that maximum one-hour CO impacts are considerably less than one-hour LSI and that the maximum 8-hour CO impact is close to the 8-hour LSI. It is expected that CO impacts will be less than these predicted values due to the conservative assumptions in the air quality analysis that were discussed in the previous subsection.

#### 3.4.3 SO<sub>2</sub>

The maximum 3-hour SO<sub>2</sub> concentration was predicted to occur 0.1 Km south-southeast of the CPF on Julian day 47 from hours 1 through 3. This period was characterized by light winds and F stability. The maximum 24-hour SO<sub>2</sub> impact was predicted to occur 0.1 Km west of the CPF on Julian day 274, which was characterized by strong winds (10 to 16 meters per second) and neutral (Class D) stability. Maximum annual SO<sub>2</sub> impacts are expected to occur 0.25 Km to the west of the CPF. Table 3-1 shows that the proposed Kuparuk sources will not result in exceedances of any NAAQS or PSD increments for SO<sub>2</sub>.



#### 3.4.4 PM

The point of maximum 24-hour PM impact from the proposed Kuparuk sources is expected to be 0.16 Km west of the SPF (Southern Production Facility) on Julian day 272, which was characterized by D stability and wind speeds from 8 to 12 meters per second. The maximum annual PM impact was predicted to occur 0.25 Km to the west of the CPF. Table 3-1 shows that the proposed project will not result in violations of any NAAQS or PSD increments for PM.

### 3.5 Other Impacts

#### 3.5.1 Class I Areas

The closest Class I area to the Kuparuk area is Mt. McKinley National Park which is located about 750 Km to the south. No significant impacts from the Kuparuk facilities are expected at this large distance.

#### 3.5.2 Soils/Vegetation

Particulates,  $\text{NO}_2$ , and  $\text{SO}_2$  are adsorbed on the soil surface resulting in the formation of particulate nitrates and particulate sulfates. These pollutants are also adsorbed on plant surfaces. In general, soils and vegetation are expected to act as a sink for most of the pollutants from the Kuparuk Oil Field sources. It appears that quantities of pollutants added to the soil, as the result of the proposed sources, will be insignificant compared to that normally present in these soils.

No information is currently available on the tolerance levels of high Arctic plants. However, probable impacts on Arctic plants can be inferred from the tolerance levels determined for plants native to lower latitudes. Pollutant concentrations resulting from all Kuparuk sources will be much less than the tolerance levels determined for lower latitude plants.

#### 3.5.3 Visibility

Increased particulates and aerosols resulting from conversion of  $\text{NO}_x$  emissions to nitrates could potentially result in some impairment of visibility in the Kuparuk and Prudhoe Bay areas. Increases in particulate emissions due to operation of the proposed facilities are not large. Therefore, little visibility degradation from particulates is expected. Increases in  $\text{SO}_2$  emissions due to the proposed facilities are also small. Consequently, the conversion of  $\text{SO}_2$  to sulfates is expected to result in small increases in sulfate concentrations. For this reason, sulfates are not expected to contribute to visibility degradation in the Kuparuk and Prudhoe Bay areas.



When NO<sub>2</sub> is emitted in sufficient quantities, a reddish-brown plume may result. NO<sub>2</sub> plumes may be visible for a short distance downwind of the Kuparuk facilities at times. This may result in some local degradation of visibility.

Enhancement of ice fog in the Kuparuk area may result from the proposed plumes, exhausts from the associated additional vehicles and buildings, and the respiration of the increased number of people in the area. This enhancement of ice fog may result in an increase in duration and frequency of occurrence of the already-existing reduction of visibility in the Kuparuk area.

#### 3.5.4 Growth Impacts

The operation of the proposed Kuparuk facilities is expected to result in 300 additional people in the work force in the Kuparuk area. Increased pollutant emissions resulting from this additional work force will be mostly limited to emissions from motor vehicles. These emissions will be very small when compared to the emissions from the proposed gas heaters and turbines. Therefore, no significant air quality impacts are expected to result from the increased population in the Kuparuk area.

#### 4.0 Findings and Recommendations

Based on the air quality analysis, the operation of the proposed Kuparuk sources is not expected to result in the violation of any PSD increments or NAAQS.

#### 4.1 Emission Limitations

Maximum allowable emissions from the proposed modification are summarized below:

<u>Equipment</u>	<u>Pollutant</u>	<u>Limit (t/yr)</u>
Gas Turbines	NO <sub>x</sub>	14,454
"	VOC	53
"	CO	2,892
"	PM	317
"	SO <sub>2</sub>	73
Process Heaters	NO <sub>x</sub>	308
"	VOC	1
"	CO	72
"	PM	63
"	SO <sub>2</sub>	13

These are annual limits for the facilities listed in Table 1-1.



In addition, specific performance limits for the turbines and heaters are as follows:

<u>Equipment</u>	<u>Pollutant</u>	<u>Emission Limit</u>
Gas Turbines	NO <sub>x</sub>	150 (14.4/Y) ppm*
	CO	109 lb/MM scf of fuel used 10 percent Opacity
Process Heaters	NO <sub>x</sub>	0.08 lb/MM BTU (a)
	CO	0.1 lb/MM BTU (b) 0.018 lb/MM BTU

\*NO<sub>x</sub> emissions factor for gas-fired turbines is modified by an efficiency factor (Y = manufacturer's rated heat rate at rated peak load) which cannot exceed 14.4 kilojoules/ watt-hour. Based at 15 percent oxygen on a dry basis.

- (a) - Applies to units of 43 MM BTU/hr. or greater.
- (b) - Applies to units less than 43 MM BTU/hr.

#### 4.2 Compliance Determination

Compliance with the emission limitations shall be demonstrated by the Company conducting source tests and a program of emissions monitoring as described below.

- (1) Compliance testing shall be conducted within 60 days after achieving the maximum production rate at which the turbines or process heaters will be operated but not later than 180 days after startup of the specific emission source. The NSPS testing requirements for NO<sub>x</sub> from gas turbines (40 CFR 60.335) shall be followed. The Company may submit for EPA approval an alternative test plan for the gas turbines addressing such alternatives as factory testing rather than onsite testing and testing of a certain proportion of the gas turbines from each model group rather than each individual gas turbine. EPA Method 7 shall be used for NO<sub>x</sub> from the process heaters. Only one of each kind of process heater must be tested. The Company shall submit a test plan to EPA for approval to demonstrate that the process heater tested is representative of the process heaters for which testing is exempted. No compliance testing is required for CO.
- (2) Compliance Monitoring--In addition to the NSPS requirements (40 CFR 60.334) one of the following monitoring schemes is required:
  - (a) a continuous monitoring system shall be installed to monitor CO or O<sub>2</sub> for all gas-fired process heaters. These monitors shall comply with the specification requirements in Appendix B of 40 CFR Part 60; or
  - (b) a periodic monitoring program for the process heaters using a portable CO or O<sub>2</sub> analyzer. The Company shall submit a monitoring plan to EPA for approval prior to startup describing the details of the program such as monitoring frequency, proposed instrumentation, quality assurance procedures, and recordkeeping.



- (3) The Company shall report any use of the COT flare, including the time, duration and reason for that use. This data shall be available to EPA upon request and maintained for a period of 2 years from the date recorded.



15 June 1981

Mike Johnston  
U.S. Environmental Protection Agency  
Region X  
1200 Sixth Avenue  
Seattle, Washington 98101

Dear Mr. Johnston:

Enclosed are the responses to your comments on the Kuparuk Oil Field Development PSD permit application. Please let me know if you have questions about these responses.

Sincerely,

*David B. Cabe*

David B. Cabe  
Senior Environmental Engineer

DBC:ts

Enclosure

cc: Mr. Scott Ronzio  
Arco Alaska, Inc.  
Alaska Region  
P. O. Box 360  
Anchorage, Alaska 99510

RECEIVED  
JUN 19 1981  
PERMITS BRANCH  
EPA - REGION 10



EPA Comment 1:

What are the UTM coordinates of the maximum impact receptors for all pollutants and averaging times? Please also supply the relative direction and distance from the nearest Arco Kuparuk facility.

Response:

All annual maximum impact receptors were predicted to occur 250 m west of the closest proposed Arco Kuparuk Oil Field facility. The UTM coordinates are supplied below.

Pollutant Averaging Time	Concentration ( $\mu\text{g}/\text{m}^3$ )	UTM Coordinates of Maximum Impact Receptor		Relative Location
		E (m)	N (m)	
Annual NO <sub>2</sub>	57.80	401000.	7804250.	250 m W of CPF
NO <sub>2</sub>	56.40	391000.	7799250.	250 m W of SPF
NO <sub>2</sub>	61.70	428250.	7801300.	250 m W of GC-2
TSP	13.82	401000.	7804250.	250 m W of CPF
TSP	12.35	391000.	7799250.	250 m W of SPF
24-hour SO <sub>2</sub>	15.84	401150.	7804250.	100 m W of CPF
TSP	25.71	390090.	7799235.	160 m WSW of SPF
TSP	23.96	401090.	7804235.	160 m WSW of CPF
3-hour SO <sub>2</sub>	140.32	401267.	7804150.	100 m SSE of CPF

EPA Comment 2:

Please supply building dimensions for all Kuparuk Oil Field sources.

Response:

The table included below lists all building dimensions for sources in the Kuparuk Oil Field.



PROPOSED KUPARUK OIL FIELD DEVELOPMENT  
 Existing and Proposed Source Building Dimensions

<u>Facility</u>	<u>Source Classification</u>	<u>Unit</u>	<u>Bldg. Length (m)</u>	<u>Bldg. Width (m)</u>	<u>Bldg. Height (m)</u>
CPF	Existing	4-5 MHP	33.5	18.3	13.3
CPF	Existing	2-14 MHP	76.2	30.5	17.4
CPF	Existing	5-10 MMBtu/hr	-----	No Building	-----
CPF	Existing	1-20 MMBtu/hr <sup>1</sup>	12.8	6.1	8.2
CPF	Existing	1-1300 lb/hr Incin	21.3	15.2	11.9
CPF	Proposed	1-40 MMBtu/hr	12.8	6.1	8.2
CPF	Proposed	3-14 MHP	76.2	30.5	17.4
CPF	Proposed	8-34 MHP	91.5	36.6	17.4
CPF	Proposed	21-10 MMBtu/hr	-----	No Building	-----
CPF	Proposed	C.O.T. Flare <sup>2</sup>			
SPF, NPF,	Proposed	8-5 MHP	33.5	18.3	13.3
WPF <sup>3</sup>	Proposed	4-14 MHP	76.2	30.5	17.4
	Proposed	25-10 MMBtu/hr	-----	No Building	-----
	Proposed	1-20 MMBtu/hr	12.8	6.1	8.2

<sup>1</sup>Modeled with stack parameters of 10 MMBtu/hr heater.

<sup>2</sup>No longer an emission source. Gas is recycled.

<sup>3</sup>SPF, WPF, and NPF have identical emissions sources.

EPA Comment 3:

Appendix A - Please explain the discrepancy on page 72 for description of source inventory Group 7.

Response:

Please delete from Appendix A, page 72 the sentence; "Group 7 contains the inventory for all Kuparuk Oil Field existing and previously licensed



sources." Please add the following to Appendix A, page 72:

"Group 7 contains the inventory for all Prudhoe Bay Unit Owners' Proposed Additional Sources (PSD IV).

Group 8 lists the inventory for all Kuparuk Oil Field existing and previously licensed sources.

Group 9 contains the inventory for all the Kuparuk Oil Field proposed sources."



M/S 521

JUN 05 1981

Mr. P. B. Norgaard  
ARCO Alaska, Inc.  
P. O. Box 360  
Anchorage, Alaska 99510

Dear Mr. Norgaard:

With the material supplied in the May 11, 1981 submittal, we have the information necessary to complete the processing of the Prevention of Significant Deterioration (PSD) permit application to install additional facilities at the Kuparuk, Alaska oil field. The effective date of the complete application is May 11, 1981.

The Clean Air Act requires that once a complete application is received, EPA must issue the final determination within one year. However, we are making every effort to complete the process in as timely a manner as possible.

If you have any questions, please do not hesitate to contact Raymond Nye of my staff at (206) 442-7176.

Sincerely,

/s/ Michael M. Johnston

Michael M. Johnston, Chief  
New Source Permits Section

cc: Stan Hungerford, ADEC  
Jim Sweeney, AOC  
Robert Courson, EPA

bc: Mark Hooper, EPA


RNYE:jb:5-29-81(#0986N)



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

DATE: May 28, 1981

SUBJECT: PSD Permit Application - ARCO  
Kuparuk, Alaska

FROM: Robert G. Courson, Chief   
Technical Support Branch (M/S 329)

TO: Michael M. Johnston, Chief  
New Source Permits Section (M/S 521)

The PSD permit application submitted by ARCO on May 11, 1981 has been reviewed. Additional information concerning the air quality analysis was requested through recent phone conversations with the Radian Corporation. This requested information has been received via phone conversation with the Radian Corporation. This information will also be submitted by letter. The application can now be considered to be complete with respect to both the air quality analysis and BACT.

cc: Dave Tetta